REMARKS/ARGUMENTS

Favorable consideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 2-10 are presently pending in this application, Claim 4 having been canceled, Claims 2 and 5-10 having been amended by the present amendment.

In the outstanding Office Action, Claims 1-6, 8-10 were rejected under 35 U.S.C. 103(a) as being unpatentable over Atari et al. (U.S. Patent 5,413,360) in view of Kawada et al. (U.S. Patent 5,665,260) and Claim 7 was rejected under 35 U.S.C. 103(a) as being unpatentable over Atari et al. and Kawada et al. in view of Yano et al. (U.S. Patent 5,232,765).

Claims 2 and 5-10 have been amended herein. These claim amendments find clear support in the specification, claims and drawings as originally filed. For example, Claim 2 is believed be supported by page, 9, lines 25-28, of the specification, and Claims 5-10 have been amended solely for clarifying antecedent basis. Hence, no new matter is believed to be added thereby.

Before addressing the outstanding art rejections, a brief summary of Claim 2 according to the present application is believed to be helpful. Claim 2 as currently amended is directed to a ceramic heater including an aluminum nitride ceramic substrate, and a heating element formed on a surface or inside of the aluminum nitride ceramic substrate, wherein the aluminum nitride ceramic substrate comprises 0.05 to 10% by weight of oxygen, and has a leakage quantity of 1×10^{-10} to 1×10^{-7} Pa $\cdot$ m^3/sec (He) by measurement with a helium leakage detector. By providing such an aluminum nitride ceramic substrate, a high thermal conductivity is ensured by the amount of oxygen, a drop of thermal conductivity at a high temperature due to excessive sintering is prevented by setting the leakage quantity within the range of 1×10^{-10} to 1×10^{-7} Pa $\cdot$ m^3/sec (He), and the property of temperature rising/falling

of the ceramic heater is improved. For instance, in Examples 1 to 11 where oxygen content is above 0.05% by weight, thermal conductivity is as high as 160 to 180 W/mK at 25 °C. On the other hand, in Comparative Examples 2 and 3 where oxygen content is less than 0.05% by weight, thermal conductivity is 140 W/mK. Also, by adjusting the degree of sintering so that the leakage quantity is set within the range of 1×10^{-10} to 1×10^{-7} Pa · m^3/sec (He), diffusion of oxygen into the ceramic crystals due to excessive sintering is prevented, and a drop of thermal conductivity at a high temperature is prevented. In Example 13 where the leakage quantity is 8×10^{-13} Pa · m^3/sec (He), the thermal conductivity at a high temperature (450°C) is lower than that of Examples 1 to 11 where the leakage quantity is 8×10^{-8} to 1×10^{-10} Pa · m^3/sec (He). It is believed that if sintering proceeds too far, oxygen is diffused into the ceramic crystals and thus deteriorates the crystallinity, and the thermal conductivity at a high temperature drops.

Atari et al. disclose an electrostatic chuck having an aluminum nitride ceramic. However, Atari et al. do not teach "an aluminum nitride ceramic substrate ..., wherein said aluminum nitride ceramic substrate comprises 0.05 to 10% by weight of oxygen, and has a leakage quantity of 1×10^{-10} to 1×10^{-7} Pa · m^3/sec (He) by measurement with a helium leakage detector" as recited Claim 2. On the other hand, Atari et al. disclose a ceramic which is preferably composed of not less than 99. 8 weight t of AlN.[1] In such a ceramic, oxygen content becomes less than 0.2 weight %. Thus, the Atari et al. ceramic is not believed to keep its thermal conductivity high by adjusting the oxygen content at a certain level. Moreover, Atari et al. clearly fail to disclose that the ceramic substrate has a leakage quantity of 1×10^{-10} to 1×10^{-7} Pa · m^3/sec (He), and do not disclose the sintering method of its ceramic substrate. Thus, the Atari et al. substrate is not believed to necessarily have a leakage quantity of 1 x

[1] Atari, column 6, lines 16 to 19.

10^{-10} to 1 x 10^{-7} Pa · m^3/sec (He), and the leakage quantity thereof is not reproducible. The Atari et al. ceramic is therefore not expected to prevent a drop of thermal conductivity at a high temperature by suppressing the densification and by controlling the leakage quantity within a specific range. Therefore, the structure recited in Claim 2 is believed to be clearly distinguishable from Atari et al.

Kawada et al. also disclose an electrostatic chuck having a nitride ceramic substrate. Nevertheless, Kawada et al. do not teach "an aluminum nitride ceramic substrate ..., wherein said aluminum nitride ceramic substrate comprises 0.05 to 10% by weight of oxygen, and has a leakage quantity of 1 x 10^{-10} to 1 x 10^{-7} Pa · m^3/sec (He) by measurement with a helium leakage detector" as recited Claim 2 either. Nor is the Kawada et al. substrate believed to necessarily have an oxygen content of 0.05 to 10% by weight and a leakage quantity of 1 x 10^{-10} to 1 x 10^{-7} Pa · m^3/sec (He). In addition, Kawada et al. do not teach or even suggest the above advantages attributable to the ceramic heater of Claim 2. The structure recited in Claim 2 is therefore believed to be distinguishable from Kawada et al.

Yano et al. disclose a distributed constant circuit board having a glass-based ceramic composition or non-glass-based ceramic composition. However, Yano et al. do not teach "an aluminum nitride ceramic substrate ..., wherein said aluminum nitride ceramic substrate comprises 0.05 to 10% by weight of oxygen, and has a leakage quantity of 1 x 10^{-10} to 1 x 10^{-7} Pa · m^3/sec (He) by measurement with a helium leakage detector" as recited Claim 2. Furthermore, even assuming *arguendo* that an oxide is added as a filler to the Yano et al. ceramic, the resultant mixture would not be a nitride-based ceramic. Furthermore, Yano et al. do not disclose the leakage quantity of the ceramic substrate, and thus the above advantages cannot be expected from Yano et al. either. Also, Yano et al. do not disclose a nitride ceramic, providing no motivation to combine with Atari et al. and Kawada et al. As such, the structure recited in Claim 2 is believed to be distinguishable from Yano et al.

Because none of Atari et al., Kawada et al. and Yano et al. discloses the aluminum nitride ceramic substrate as recited in Claim 2, even the combined teachings of these cited references are not believed to render the ceramic heater recited in Claim 2 obvious.

For the foregoing reasons, Claim 2 is believed to be allowable. Furthermore, since Claims 5-10 ultimately depend from Claim 2, substantially the same arguments set forth above also apply to these dependent claims. Hence, Claims 5-10 are believed to be allowable as well.

In view of the amendments and discussions presented above, Applicant respectfully submits that the present application is in condition for allowance, and an early action favorable to that effect is earnestly solicited.

Respectfully submitted,

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